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*O.W.R.C.
Water Pollution
Survey*

THE
ONTARIO WATER RESOURCES
COMMISSION

WATER POLLUTION SURVEY

of the

VILLAGE OF NEWBURGH

COUNTY OF LENNOX & ADDINGTON

1970



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THE
ONTARIO WATER RESOURCES
COMMISSION
REPORT ON A
WATER POLLUTION SURVEY
OF THE
VILLAGE OF NEWBURGH
IN THE
COUNTY OF LENNOX & ADDINGTON
DIVISION OF SANITARY ENGINEERING
DISTRICT ENGINEERS BRANCH

REPORT ON A WATER POLLUTION SURVEY
OF THE VILLAGE OF NEWBURGH

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REPORT ON A
WATER POLLUTION SURVEY
of the
VILLAGE OF NEWBURGH

INTRODUCTION

Information on the nature of water pollution in the Village of Newburgh and the need for its prevention and control is provided in this report. To completely assess the quality of water in the Napanee River and streams flowing into the river around Newburgh, a monitoring programme was commenced in 1965 by staff of the District Engineers Branch, Ontario Water Resources Commission. Based on the information gathered to date, enough is known to justify the recommendations presented in this report to cope with certain obvious sources of pollution.

BRIEF HISTORY AND LOCATION

The Village of Newburgh is located in the County of Lennox and Addington approximately six miles north east of the Town of Napanee.

Records reveal that the Village of Newburgh was first settled in 1822 by settlers from the British Isles and the Continent (Europe) and was known at that time as "The Hallow". However, it was not until 1839 that it acquired its present name, apparently after the Earl of Newburgh.

Within the village limits there is only one main industry - Newburgh Milk Products Limited. Employment is mainly from industries located in the larger centres such as the Town of Napanee or the City of Kingston. The dominating agricultural nature of the area

surrounding Newburgh has influenced to a certain extent the influx of retired farmers to the village. Therefore, over the years people living on fixed incomes have become predominant in the Village of Newburgh.

TOPOGRAPHY AND SOIL CONDITIONS

The bedrock geology of the Newburgh area consists of Ordovician limestone properly called the Black River limestone. This formation is fine-grained and generally thickly bedded.

The Newburgh soils deposited over the limestone along the Napanee River are well drained. The parent materials of these soils consist of alluvial deposits of fine sand and silt. In the north west section of the village a grey, calcareous loam till overlies the bedrock. Generally, there is only one or two feet of this soil material with bedrock showing through in many areas. South of County Road No. 1, a well drained, loose single-grained soil sparsely covers the bedrock. The soil is reported to have a low water-holding capacity.

The topography consists of valley slopes and smooth narrow divides between the valleys. Permanent streams, drainage courses and steep side gullies project back acutely into the upland on both sides of the Napanee River.

The soil deposits in the built up area of the village and along the Napanee River vary between 3 to 20 feet.

POPULATION

According to the Municipal Directory the population of the Village of Newburgh in 1969 was 606. Although a rather irregular growth pattern on a year to year basis has occurred over

the past five years, the growth has averaged out to about 2% annually, closely approximating the provincial average.

Some newly constructed homes in the village have contributed to the general average growth rate.

In a report prepared by Wyllie and Ufnal Limited "Preliminary Design Report For Water Works Programme" July 1970, it was stated that the population was housed in 192 buildings for an average of 3.2 persons per building.

PROPOSED DEVELOPMENT & GROWTH

It appears reasonable to apply the provincial annual population rate of 2% for the probable growth in the village. Several ideal sites particularly in the north east and south west section of the village could accommodate several large subdivisions if a major growth occurred. As no industries are anticipated, at least in the immediate future, the village will in all likelihood continue to grow at the normal rate. Registered lots in the built up area and along County Road No. 1 will continue to be built upon.

EXISTING SERVICES

At present the residents depend on septic tank systems to conveniently treat domestic waste. Based on the parameters soil permeability, depth of soil to bedrock, soil type, and topographical location; used to evaluate subsurface systems, the septic tank systems on an average should be operating satisfactory. Information gathered from building contractors confirmed this opinion. To supplement these reports, however, a random number of properties was selected for investigation to determine whether

or not the on-site sewage disposal systems were operating properly. No wet spots in the lawn, rank vegetal growth, or noticeable odours were detected. On small lots adjacent to the Napanee River, it was suspected that a discharge to the river would be found. A walk along the river failed to confirm any of these suspicions. Nevertheless, the question still arises, what type of treatment is being used on these small lots.

In one case, a tank at Concession Street, across from Newburgh Milk Products Limited with no tile bed system was found to be very unsatisfactory. Apparently, the tank was constructed to hold wastes from the industry. It was then to be pumped out periodically and no discharge was to be allowed to the stream flowing in the vicinity of the plant. On August 4, 1970, it was evident that the tank had not been used for quite some time but a discharge had occurred in the past. To prevent any future discharges when the tank is used all outlets should be plugged ensuring a closed system.

Most of the buildings being constructed in the Village of Newburgh utilize septic tank systems that are **approved** by the Kingston, Frontenac, and Lennox and Addington Health Unit. Conditions conducive to this type of installation exist in the built up area of the village.

Individual wells with minimal capacity ranging from approximately one to ten gallons per minute are predominant. In dry summer months a sufficient quantity of water is not available to meet the demands of some residents.

SAMPLING STATIONS AND RESULTS

As stated previously, bacteriological and chemical samples

were collected each year at 8 stations shown in Appendix One since 1965. The bacteriological samples were analysed at the Department of Health Laboratory and the Ontario Water Resources Laboratory. To determine the coliform bacteria the Most Probable Number (MPN) and the Membrane Filter Methods were used to yield the appropriate information. In order to prevent confusion as to the type of analysis conducted, the two methods were distinguished from one another as shown in Appendix One.

All chemical samples were analysed at the Ontario Water Resources Laboratory and the techniques used were generally those specified in "Standard Methods".

A brief review of the sampling stations and the results of the samples is as follows:

Sampling Station NNX - 14.4

A small drainage ditch which meanders beside the cemetery in the south east section of the village was sampled just before it discharged into the Napanee River. As expected, the flow in the ditch is very minimal averaging about 5 gallons per minute. In fact, during one of the samplings; October 14, 1969 there was no flow in the ditch.

According to the bacteriological results, the geometric mean for the six years was calculated to be 303 total coliforms per 100 ml. Although the total coliform population was relatively low, fecal coliforms were on the other hand above the number expected. It is felt that external sources of fresh waste from rodents, dogs, other animals etc. contributed substantially to the above.

The 5-Day BOD and suspended solids concentrations also did not reveal any significant sources of severe pollution being

transported by this body of water to the Napanee River.

Sampling Station NN - 14.4

Station NN - 14.4 was selected upstream of the Village of Newburgh beside the forms of the old dam in the Napanee River. Again no gross pollution was observed or revealed by the samples. The following information has been summarized for this particular station:

GEOMETRIC MEAN OF BACTERIOLOGICAL RESULTS...386 total coliforms
per 100 ml.

AVERAGE 5-DAY BOD.....1.2 ppm.

AVERAGE SUSPENDED SOLIDS CONCENTRATION.....3 ppm.

Sampling Station NN - 14.2

Station NN - 14.2 is located at the intersection of the North Channel and George Street. Very similar results were obtained as for the previous station in the Napanee River. The geometric mean for total coliforms was estimated at 429 per 100 ml.

Sampling Station NN - 14.0

This station located in the heart of the village at Main Street, was selected mainly to ascertain if any sources of pollution were emanating from the core area. Results of the samples failed to reveal any serious contamination.

Sampling Station NN - 13.8

Samples were also collected in the North Channel at the corner of Front and Mill Streets. No significant change in the quality of the water was determined in the channel as it flowed through the village.

Sampling Station NNC - 13.71

A small stream draining through the north westerly

section of the village was sampled upstream of Newburgh Milk Products. Staff of the OWRC have noticed that the flow in the creek was at the most only trickling through the depressed area. In the last two years the stream was dry at the time of sampling.

On three occasions between 1965 and 1968 inclusive, the bacteriological results were very high. The presence of high numbers of fecal coliforms denoted recent fecal pollution since these coliforms cannot multiply in natural sites outside the body and are known to rapidly die and disappear. Most of the lots adjacent to the stream are relatively large and of sufficient size to contain an adequate tile bed system. On the other hand, there are areas where soil overlying the bedrock is shallow and it is quite conceivable that seepage into the rock and the stream from subsurface systems has occurred. The chemical analysis though lacking the sensitivity of bacteriological tests also assisted staff in determining that indeed the quality of the water in the creek was below standard.

Sampling Station NNC - 13.70

Downstream of the Newburgh Milk Products, the stream was again sampled and surveyed. Not only have the bacteriological results been consistently adverse but the chemical samples have also revealed a very serious pollution hazard. Taking the bacteriological results for the years with an exact count, the geometric mean was calculated to be 1,242,000 coliforms per 100 ml.

It is understood that the industry has taken measures to eliminate some of the gross pollution and this has been exemplified by the noticeable decrease in 5-Day BOD concentration in the last two years. This, however, is not sufficient as extremely high

coliform counts have been obtained, chemical results continue to exceed the OWRC objectives, and the nutrients in the creek are relatively high.

In addition to the milky appearance of the water, congealing of whey materials along the banks of the creek was observed on most of the investigations. During periods of a high state of decomposition, obnoxious odours have resulted in many complaints being received by the Ontario Water Resources Commission staff.

Sampling Station NN - 13.3

Samples collected from station NN - 13.3 at the extreme westerly limits of the village showed no noticeable decrease in the quality of water after flowing through the village. It should be mentioned that this situation is upstream of the point at which the creek draining through the property of Newburgh Milk Products Limited discharges into the Napanee River.

SUMMARY OF RESULTS

A close review of the results will indicate that on October 18, 1967 most of the results were above normal and did not represent the general quality of the water in the Napanee River or the waters around the Village of Newburgh flowing to the River. The high counts can be explained by the fact that during the week of October 16th, 1967 heavy downpours occurred, resulting in a flushing effect on the drainage area.

In summary, the bacteriological and chemical results of the samples collected from the Napanee River over the years were generally satisfactory. In addition, the drainage ditch flowing

west of the cemetery showed no signs of contributing any pollutants to the river. Unfortunately, the same cannot be said for the creek that received wash water and whey materials from Newburgh Milk Products Limited. Gross pollution was evident in the stream from the company to the Napanee River. At the same time there have been occasions when bacteriological results upstream of the company have been adverse. It is extremely difficult to pinpoint the source of such contamination but subsurface systems are highly suspected in view of the sparse soil covering over bedrock. With the minimum flow and sluggish nature of the stream, the source of the pollution need not be great to alter the quality of water in the stream.

RESULTS OF WELL SURVEY

On October 1, 1970, staff of the OWRC, with the co-operation of the local health unit staff, carried out a comprehensive survey of the private wells in the village. Some 79 wells were sampled, representing approximately 65% of the total. The results of the survey are shown below:

<u>TYPE OF WATER SUPPLY</u>	<u>BACTERIOLOGICAL QUALITY</u>		
	<u>SATISFACTORY</u>	<u>DOUBTFUL</u>	<u>UNSATISFACTORY</u>
63 Drilled Wells	32	24	7
12 Dug Wells	1	4	7
3 Springs	0	1	2
1 Cistern	0	1	0

58% of Samples - Coliform contamination all types.

20% of Samples - Fecal coliform contamination.

50% of drilled wells - Coliform contamination all types.

11% of drilled wells - fecal coliform contamination.

92% of dug wells - coliform contamination all types

58% of dug wells - fecal coliform contamination

* Satisfactory (total coliform organisms = 0)
(fecal coliform organisms = 0)

** Doubtful (total coliform organisms = Present)
(fecal coliform organisms = 0)

*** Unsatisfactory (total coliform organisms = Present)
(fecal coliform organisms = Present)

Results of this survey indicate the pollution is localized within the municipality. This conclusion is based on the fact that the quality of the surface water did not deteriorate through the village. Much of the pollution which is indicated in the local wells can likely be attributed to improper seals and inadequate well structures.

PROPOSED PROJECTS

The Village of Newburgh is presently engaged with the Ontario Water Resources Commission in the development of a Provincial Project to provide water and sewage facilities to the residents of the village.

In view of an inadequate groundwater supply, the consultant has been asked to prepare a design report on the treatment of water from the Napanee River. As the drainage area for the river is through many swamps, taste and odour problems will still probably occur even with complete treatment. The Town of Napanee have experienced similar conditions.

With respect to waste treatment, the original thought was to construct a total or seasonal retention lagoon. Inadequate soil, nature of the topography, and the necessity for a lengthy forcemain

were all constraints placed on such an installation. Since the original report, the consultant has proposed an activated sludge package plant with a continuous discharge to the Napanee River.

As of this date, the consultant is still finalizing and completing both design reports.

SUMMARY

No intensive growth is anticipated in the Newburgh area for the immediate future. The community can develop to a certain extent with septic tanks in areas where the soil is suited for such development. With the assistance of the Health Unit such areas can readily be selected. Of course, municipal services would eliminate the problems elaborated on in the report while at the same time encouraging growth and development.

It is concluded that the stream flowing through the westerly section of the village is the only major source of pollution to the Napanee River. The appearance, odour, and sample results confirm that Newburgh Milk Products Limited has severely polluted this particular body of water for a number of years.

Although no subsurface systems were observed to be operating inadequately the occasional small lot, minimum soil overlying bedrock in certain sections and soil slope question the efficiency of some systems. Newly constructed subsurface systems approved by the Kingston, Frontenac, and Lennox and Addington Health Unit of course are operating satisfactory. On an average it is felt the septic tank systems are being used successfully.

Over one-half of the private wells sampled in the village were found to be unsatisfactory. In all likelihood, improperly

constructed wells would be the major cause of the unfavourable results, however, it should be mentioned that some newly drilled wells also showed the presence of coliform bacteria.

The major problem in this municipality is the fact that some of the wells may be contaminated by a source or sources of pollution beyond the control of the concerned well owners. In such cases there are two alternatives for correction. A complete intensive survey could be made of all private sewage disposal systems. Such a study is very time consuming and the results cannot be guaranteed. The other alternative is to construct public water and sewage works. This will also provide greater flexibility and growth potential within the municipality.

The Village of Newburgh is presently engaged in a programme with the Ontario Water Resources Commission to provide water and sewer services to the residents.

RECOMMENDATIONS

1. All contaminating waste discharges from Newburgh Milk Products Limited should be eliminated. Our Division of Industrial Wastes will be informed of the results obtained from the survey.
2. The holding tank across the road from Newburgh Milk Products Limited should be completely sealed to prevent any discharge to the creek.
3. The municipality should ensure that adequate water and sewer services are available to all residents.

RAD/jmc

Report prepared by.....
R.A. Dunn, P. Eng.,
Division of Sanitary Engineering.

APPENDIX ONE
VILLAGE OF NEWBURGH
WATER POLLUTION SURVEY

<u>SAMPLE POINT NO.</u>	<u>DESCRIPTION</u>	<u>DATE</u>	<u>5-DAY BOD</u>	<u>S O L I D S</u>			<u>BACTERIOLOGICAL EXAMINATION</u>			
				<u>TOTAL</u>	<u>SUSP.</u>	<u>DISS.</u>	<u>MEMBRANE FILTER PER 100 ML.</u>		<u>MOST PROBABLE NO. PER 100 ML.</u>	
							<u>TOTAL</u>	<u>FECAL</u>	<u>TOTAL</u>	<u>FECAL</u>
				<u>COLIFORMS</u>			<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>
NNX 14.4	Cemetery Creek at Napanee River	Nov.19/65	0.2	276	1		330			
		Nov.22/66	1.2	300	<15		316			
		Oct.18/67	0.6	342	2	340			540	8
		Apr.22/68	1.5	294	1	293	84			
		Oct.21/68	1.7	264	3	261	350	180		
		Aug. 4/70	0.4	240	5	235	470	170		
NN 14.4	Napanee River at dam upstream of Newburgh	Nov.19/65	2.1	190	1	189	370			
		Nov.22/66	1.2	204	<15		184			
		Oct.18/67	0.8	186	2	184			16,000	3,100
		Apr.22/68	1.9	184	2	182	70			
		Oct.21/68	1.1	242	2	240	300	220		
		Oct.24/69	0.4	90	5	85	510	380		
		Aug. 4/70	1.2	170	5	165	110	46		

APPENDIX ONE
VILLAGE OF NEWBURGH
WATER POLLUTION SURVEY

<u>SAMPLE POINT NO.</u>	<u>DESCRIPTION</u>	<u>DATE</u>	<u>5-DAY BOD</u>	<u>S O L I D S</u>			<u>BACTERIOLOGICAL EXAMINATION</u>			
				<u>TOTAL</u>	<u>SUSP.</u>	<u>DISS.</u>	<u>MEMBRANE FILTER PER 100 ML.</u>		<u>MOST PROBABLE NO. PER 100 ML.</u>	
							<u>TOTAL</u>	<u>FECAL</u>	<u>TOTAL</u>	<u>FECAL</u>
							<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>
NN 14.2	North Channel at George Street	Nov.19/65	1.0	218	1	217	470			
		Nov.22/66	1.6	222	15	-	420			
		Oct.18/67	0.7	180	2	178			7,700	3,000
		Apr.22/68	1.8	190	3	187	110			
		Oct.21/68	0.8	222	1	221	600	300		
		Oct.14/69	0.6	130	5	125	530	240		
		Aug. 4/70					50	34		
VN 14.0	Napanee River at Main St. Newburgh	Nov.19/65	1.3	180	1	179	240			
		Nov.22/66	1.6	258	15	-	280			
		Oct.18/67	0.8	178	2	176			5,500	4,400
		Apr.22/68	1.7	200	1	199	100			
		Oct.21/68	1.9	232	1	231	1,200	200		
		Oct.14/69	0.6	140	5	135	510	280		
		Aug. 4/70	1.0	180	5	175	110	40		

APPENDIX ONE
VILLAGE OF NEWBURGH
WATER POLLUTION SURVEY

<u>SAMPLE POINT NO.</u>	<u>DESCRIPTION</u>	<u>DATE</u>	<u>5-DAY BOD</u>	<u>S O L I D S</u>			<u>BACTERIOLOGICAL EXAMINATION</u>			
				<u>TOTAL</u>	<u>SUSP.</u>	<u>DISS.</u>	<u>MEMBRANE FILTER</u>		<u>MOST PROBABLE NO.</u>	
							<u>PER 100 ML.</u>		<u>PER 100 ML.</u>	
							<u>TOTAL</u>	<u>FECAL</u>	<u>TOTAL</u>	<u>FECAL</u>
							<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>	<u>COLIFORMS</u>
NN 13.8	North Channel at West End at Mill	Nov.19/65	1.6	210	2	208	290			
		Nov.22/66	1.4	204	15	-	280			
		Oct.18/67	0.9	172	1	171			20,000	2,800
		Apr.22/68	1.8	186	3	183	150			
		Oct.21/68	0.8	218	1	217	550	200		
		Oct.14/69	1.0	-	5	-	370	200		
		Aug. 4/70	1.4	170	5	165	140	20		
NNC 13.71	Factory Creek upstream at factory	Nov.19/65	1.8	482	39	443	240,000+			
		Nov.22/66	0.9	464	15	-	368			
		Oct.18/67	1.5	482	14	468			17,000	3,200
		Apr.22/68	1.3	594	18	576	200			
		Oct.21/68	0.5	524	2	522	1,000+	600		
		Oct.14/69	N O		F L O W					
		Aug. 4/70	N O		F L O W					

APPENDIX ONE
VILLAGE OF NEWBURGH
WATER POLLUTION SURVEY

<u>SAMPLE POINT NO.</u>	<u>DESCRIPTION</u>	<u>DATE</u>	<u>5-DAY BOD</u>	<u>S O L I D S</u>			<u>BACTERIOLOGICAL EXAMINATION</u>			
				<u>TOTAL</u>	<u>SUSP.</u>	<u>DISS.</u>	<u>MEMBRANE FILTER</u>		<u>MOST PROBABLE NO.</u>	
							<u>PER 100 ML.</u>		<u>PER 100 ML.</u>	
				<u>TOTAL</u>	<u>COLIFORMS</u>	<u>FECAL</u>	<u>COLIFORMS</u>	<u>TOTAL</u>	<u>FECAL</u>	<u>COLIFORMS</u>
NNC 13.7	Factory Creek downstream of Newburgh Cheese Factory	Nov.19/65	690	978	244	734	4,600			
		Nov.22/66	100	586	37	549	99,000			
		Oct.18/67	75	634	120	514		3,900,000	40,000	
		Apr.22/68	2,100	3,036	237	2,799	1,330,000,000			
		Oct.21/68	9,000	13,682	731	12,951	11,000+	11,000+		
		Oct.14/69	90	620	55	565	11,000+	11,000+		
		Aug.4/70	28.0	580	40	540	8,000,000+	26,000		
NN 13.3	Napanee River downstream of Newburgh	Nov.19/65	1.4	196	2	194	240			
		Nov.22/66	1.8	260	15	-	360			
		Oct.18/67	1.2	160	4	156		8,000	4,700	
		Apr.22/68	1.9	204	1	203	100			
		Oct.21/68	0.5	238	2	236	300	140		
		Oct.14/69	1.0	-	5	-	390	96		
		Aug. 4/70	0.8	170	5	165	85	20		

APPENDIX TWO

VILLAGE OF NEWBURGH

NUTRIENT EVALUATION - AUGUST 4, 1970.

<u>SAMPLING STATION</u>	<u>PHOSPHORUS AS P</u>		<u>NITROGEN AS N</u>			
	<u>TOTAL</u>	<u>SOLUBLE</u>	<u>FREE</u> <u>AMMONIA</u>	<u>TOTAL</u> <u>KJELDAHL</u>	<u>NITRITE</u>	<u>NITRATE</u>
NNX - 14.4	0.014	0.008	0.01	0.15	0.007	0.25
NN - 14.4	0.032	0.007	0.01	0.64	0.003	0.01
NN - 14.2	0.042	0.007	0.01	0.80	0.004	0.01
NN - 14.0	0.028	0.007	0.01	0.76	0.003	0.01
NN - 13.8	0.028	0.006	0.01	0.70	0.003	0.01
NNC - 13.71		NC	F L O W			
NNC - 13.70	0.600	0.018	0.01	3.00	0.008	0.01
NN - 13.3	0.040	0.008	0.01	0.66	0.002	0.01

Appendix Three

Significance of Laboratory Analyses

Bacteriological Examinations

The Membrane Filter technique is used to obtain a direct enumeration of coliform organisms and is reported per 100 millilitres of the sample.

The Most Probable Number (MPN) method provides an index of the number of coliform organisms per 100 cubic centimetres of the water sample. The Multiple Tube Fermentation technique was employed.

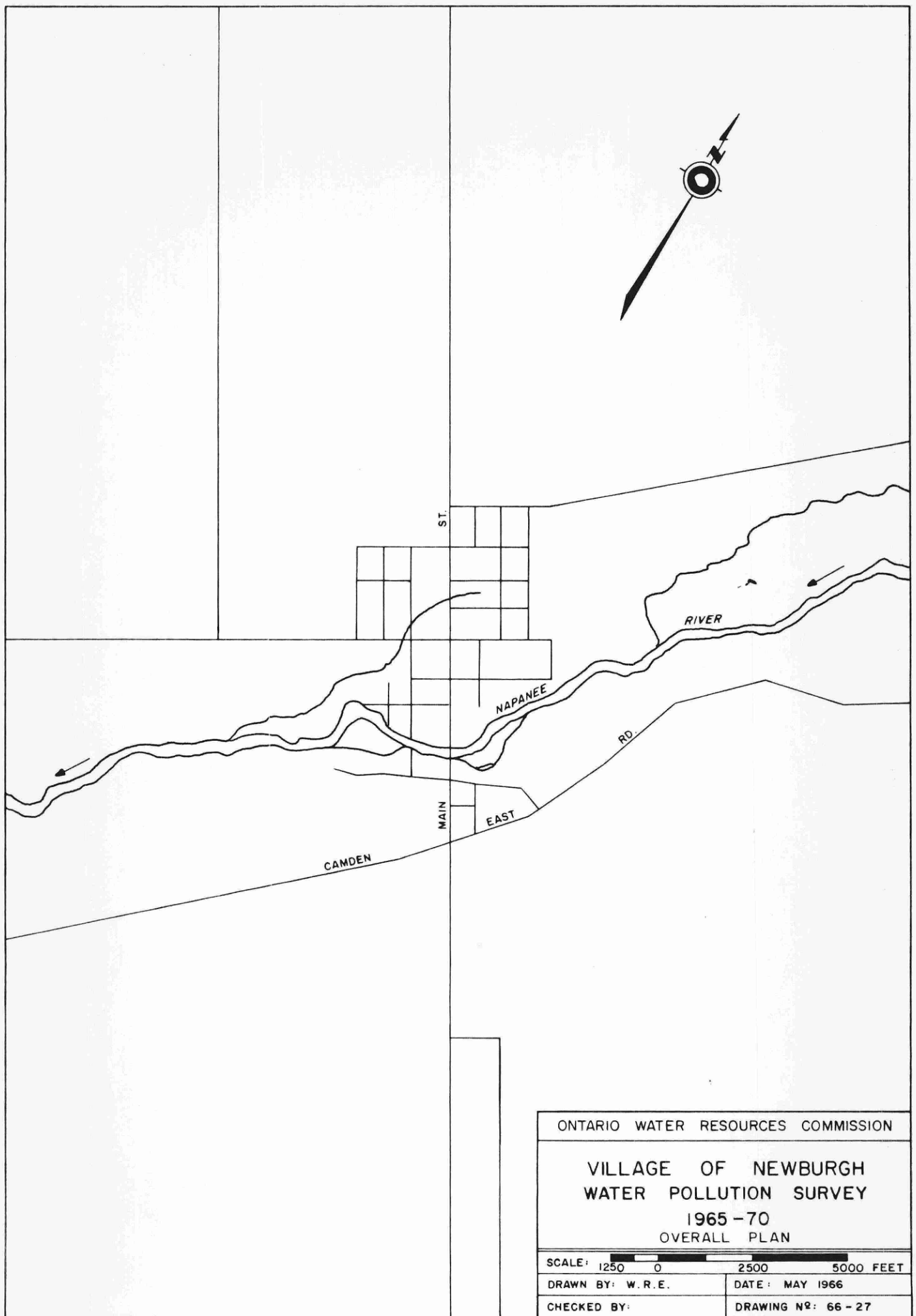
Although the presence of coliforms indicates pollution from human or animal excrement, or from non-faecal sources, *E. Coli* organisms originate in the intestinal tract of humans and other warm blooded animals.

Biochemical Oxygen Demand (BOD)

The BOD test indicates the amount of oxygen required for stabilization of the decomposable organic matter found in the sewage, sewage effluent, polluted waters or industrial wastes by aerobic biochemical action. The time and temperature used are 5 days and 20°C respectively.

Solids

The analyses for solids include tests for total, suspended and dissolved solids and are reported in parts per million (ppm). The first test measures both the solids in solution and suspension. The suspended solids indicate the measure of undissolved solids of organic or inorganic nature in suspension. Significant sources of suspended solids are sewage, industrial wastes and land erosion. The dissolved solids are a measure of those solids in solution.



ONTARIO WATER RESOURCES COMMISSION

VILLAGE OF NEWBURGH
WATER POLLUTION SURVEY

1965-70
OVERALL PLAN

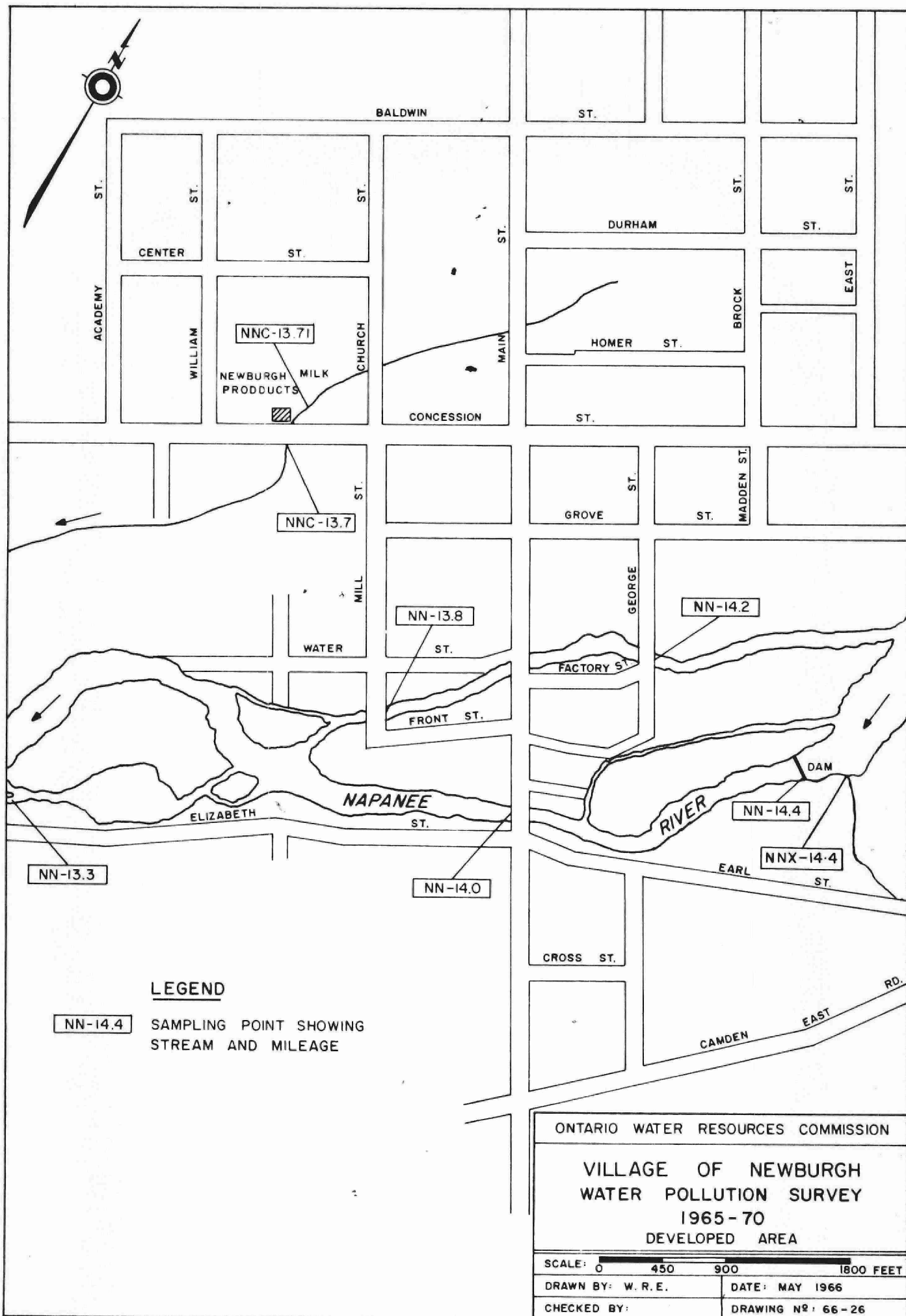
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DRAWN BY: W.R.E.

DATE: MAY 1966

CHECKED BY:

DRAWING NO: 66-27





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